

# **Declaration Management Experiment Plan**

**Presented to:**

**AMG-13**

**17 July 1996**

# **AMG 13 Brief**

- **Summary Of Declaration Management Experiments**
- **Summary Of RTI 0.33e API**
- **Present Set-up At TestBed**
- **Summary Of Status**
- **Preliminary results**
  - **Baselining Effort with RTI 0.33**
  - **Initial Results with RTI 0.33e**
- **Plans / schedule**

# **Objectives Of Declaration Management Experiments**

- **Support HLA definition of filtering by exercising proposed API.**

## **Determine**

- **Which Functions Belong in the RTI and Which Belong in the Federates?**
- **How are RTI Services Accessed (Interface Specification)?**
- **Can a wide range of Filtering concepts be supported by the API?**

## **through**

- **integration and testing of RTI functionality in RTI v0.33e,**
- **using JPSD IEC to implement federate use of these DM services to exercise the API.**
- **Assess performance implications of initial prototype implementation as a basis for evolution of RTI development**

# DM Testing

- **Key factors:**
  - what is baseline cost (without filtering)?
  - what is best case cost (perfect filtering)?
  - what is host loading *caused* by filtering?
  - what is host loading *saved* by filtering?
- **RTI must be tested across all test scenarios, with increasing scale for:**
  - entity count
  - host count
  - state change rates
- **Caveats:**
  - Exact performance results not expected from RTI prototype -- trends and scaling are.
  - Filtering experiments will focus on update\_attributes first, interactions second.

# DM Experimentation Plan

- **Scenario Analysis Tool (SAT):**
  - Create an ‘abstract federation’ to generate workload, establish baseline cases for community to reference.
    - » scripted actions (i.e.. predictable and constant).
    - » scalable, calibrated via ModSAF experiments.
- **Create ‘baseline scenarios’ which roughly correspond to expected federation activities. Use scenarios to drive CLCGF and SAT.**
- **Create ‘stress scenarios’ which test the known pathological cases.**

# **Planned Scenarios**

## **(Based on existing CLCGF scenarios)**

- **Case 1 - Ground Forces (25-50)**
  - Entities: Blue M1; Red T72M
  - Blue forces begin approx 5 km from red forces, and conduct attack against red forces in position.
- **Case 2 - Ground + Fast Movers (50-100)**
  - Entities: Blue M1, F16D, A10; Red T72M, MiG27, MiG29 Su25
  - Blue forces begin approx 5 km from red forces, and conduct attack against red forces in position. Blue aircraft conduct air-to-ground attacks against red tanks, and red aircraft recon in circular orbit around the red tank position.
- **Case 3 - Ground + Fast Movers + WAV (100-250)**
  - Entities: Blue M1, F16D, A10, US UAV CAP; Red T72M MiG27, MiG29, Su25, USSR UAV CAP
  - Blue UAVs conduct early reconnaissance of red tank positions. Red UAVs conduct recons of blue tank force routes. Blue tanks begin approx 5 km from red forces, and conduct attack against red forces in position. Blue aircraft conduct air-to-ground attacks against red tanks, and red aircraft circle around the red tank position.
- **Add scale based on performance results.**

# Use of RTI Filter Space Mechanisms

- **Filtering on geographic location**
  - Filter on x, y axis
  - An entity's subscription extent will be set to 2x it's radar range and reset when it approaches 1x.
  - An entity's publication extent will be set based on it's location and thresholds returned from the RTI.
  - Design & implementation will allow easy extension to filter on additional Filter Space variables.

# **Basic Declaration Management Services**

- **Publication -- Federate Tells the RTI What Object Classes & Their Attributes it can Update**
- **Subscription -- Federate Tells the RTI the Object Classes & Their Attributes in Which it is Interested**
- **Attribute Update -- Federate Tells the RTI the Value of an Attribute That it Owns**
- **Reflect Attribute -- RTI Distributes Attribute Value to Subscribing Federate(s)**



# Implementation Considerations

- **RTI Maintains No Knowledge of Simulation or Participants (Basic HLA Philosophy)**
- **RTI Maintains No Knowledge of the Meaning or Format of the Attributes it Transports**
- **Therefore RTI cannot Directly Examine & Filter on Attribute Values**
- **Federate & RTI Cooperate on Value Filtering**
  - **Federate Provides Additional Information to the RTI Based On its Knowledge of the Simulation**
  - **Publication & Subscription may be Based on Such Additional Information**

# **Proposed HLA Baseline Approach**

- **Federates Define One or More “Filter Specs”**
  - **Indicate Dimensions & Attribute Values on Which a Federation Would Like to Manage Interest Specifications**
- **Federates Subscribe & Publish in Terms of these Filter Specs**
- **Federates Associate Attribute Values with Filter Specs when they are Updated**
- **RTI Manages Flow of Data Based on Subscribers/Publishers Associated with the Filter Specs**

# Summary of RTI 0.33e API

- **create\_filter\_spec( space\_id, extents);**
- **delete\_filter\_spec (fspec);**
- **set\_extents (fspec, extents);**
- **get\_threshold (fspec, thresholds);**
- **rti\_subscribe\_object\_class (the\_class, attribute\_list, fspec);**
- **rti\_unscribe\_object\_class (the\_class, fspec);**
- **rti\_subscribe\_interaction\_class(the\_class, fspec);**
- **rti\_unsubscribe\_interaction\_class(the\_class, fspec);**
- **associate\_filter\_spec(object\_id, attribute\_list, filter\_spec)**
- **rti\_send\_interaction( interaction, initiator, receiver, parameters,  
the\_time, user\_time, fspec, id):**

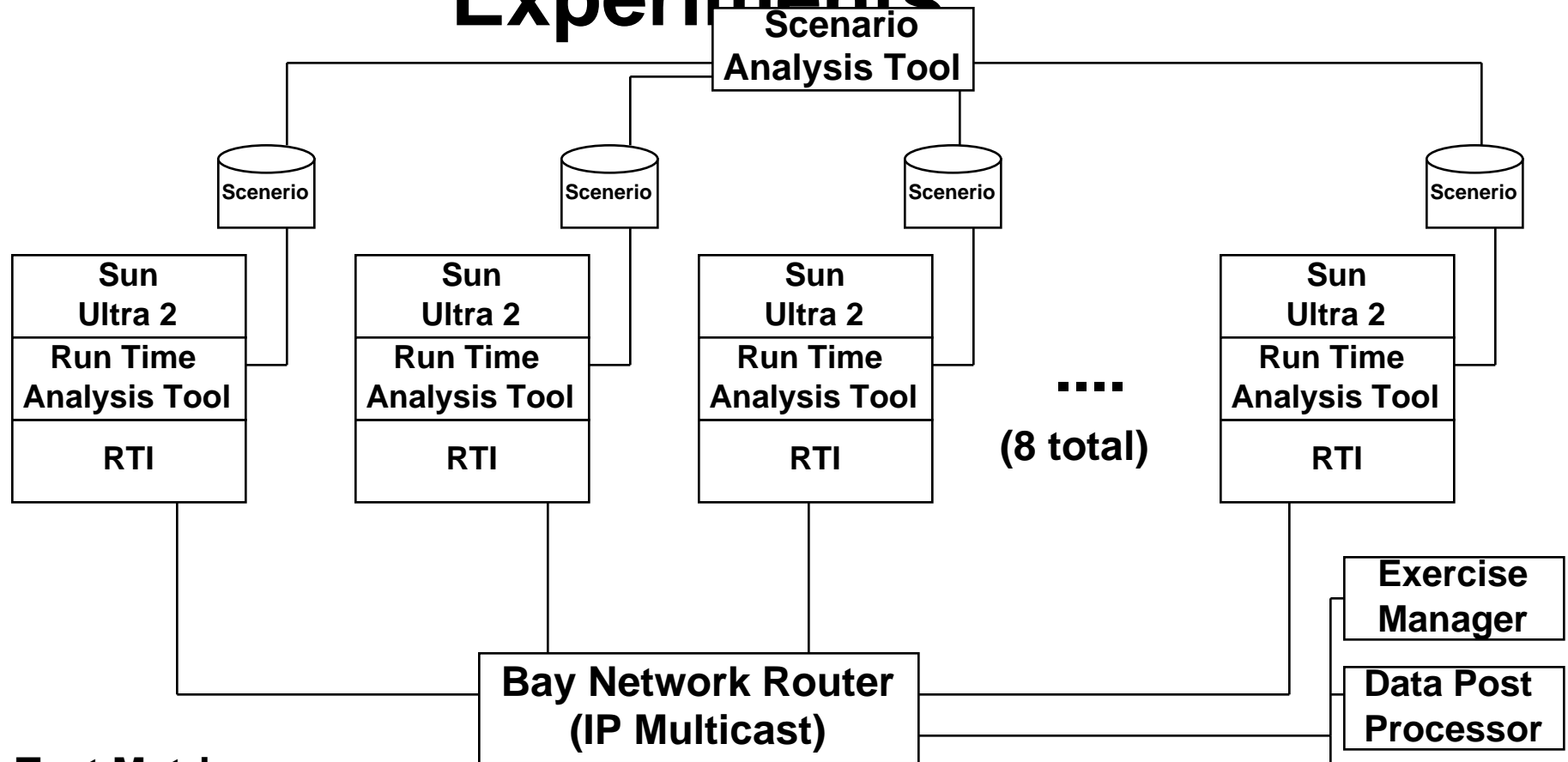
# Current Status of Experiments

- **Synthetic Workload Tool**
  - Extensions have been completed to the SAT tool for entity-level traffic generation.
  - SAT (beta) has been ported to the SUN platform.
  - SAT is installed into the IEC testbed.
- **Physical Network Baseline**
  - Incorporation of NRL/SEID work: Completed calibration of cost of network accesses in a multicast environment.
  - Collection of network and protocol statistics in IEC has begun.
- **Scenarios**
  - Several test scenarios have been defined (3 cases) for the Synthetic Workload Tool. Case 1 scenarios have been created and are running.
- **Execution Plans**
  - Exercise Manager plans for initial tests have been implemented and tested at the testbed. (Automated mechanism for launching repeatable tests.
  - Initial Data analysis programs tested and operational.

# **Current Status of Experiments (cont...)**

- **RTI v0.33e**
  - Integration completed, operational over Ethernet - ATM conflicts are being worked by MIT/LL.
  - Initial Testing is underway.
  - Filter Space support completed, no problems with API supporting geographical filtering.
- **Performance Instrumentation**
  - FCS/RTI instrumentation completed.
  - Network & process MOPs being collected.
  - Federate level Latencies being collected .

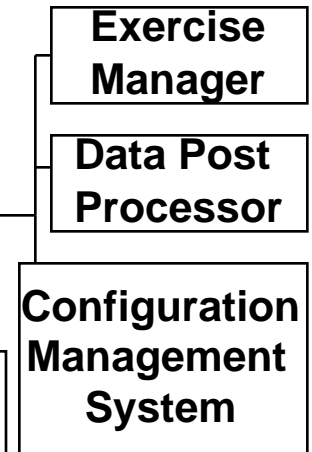
# Present Configuration For Experiments



**Test Matrix**

# host	1	2	3	4	5	6	7	8
2 host	20	20						
4 host	10	10	10	10				
8 host	5	5	5	5	5	5	5	5

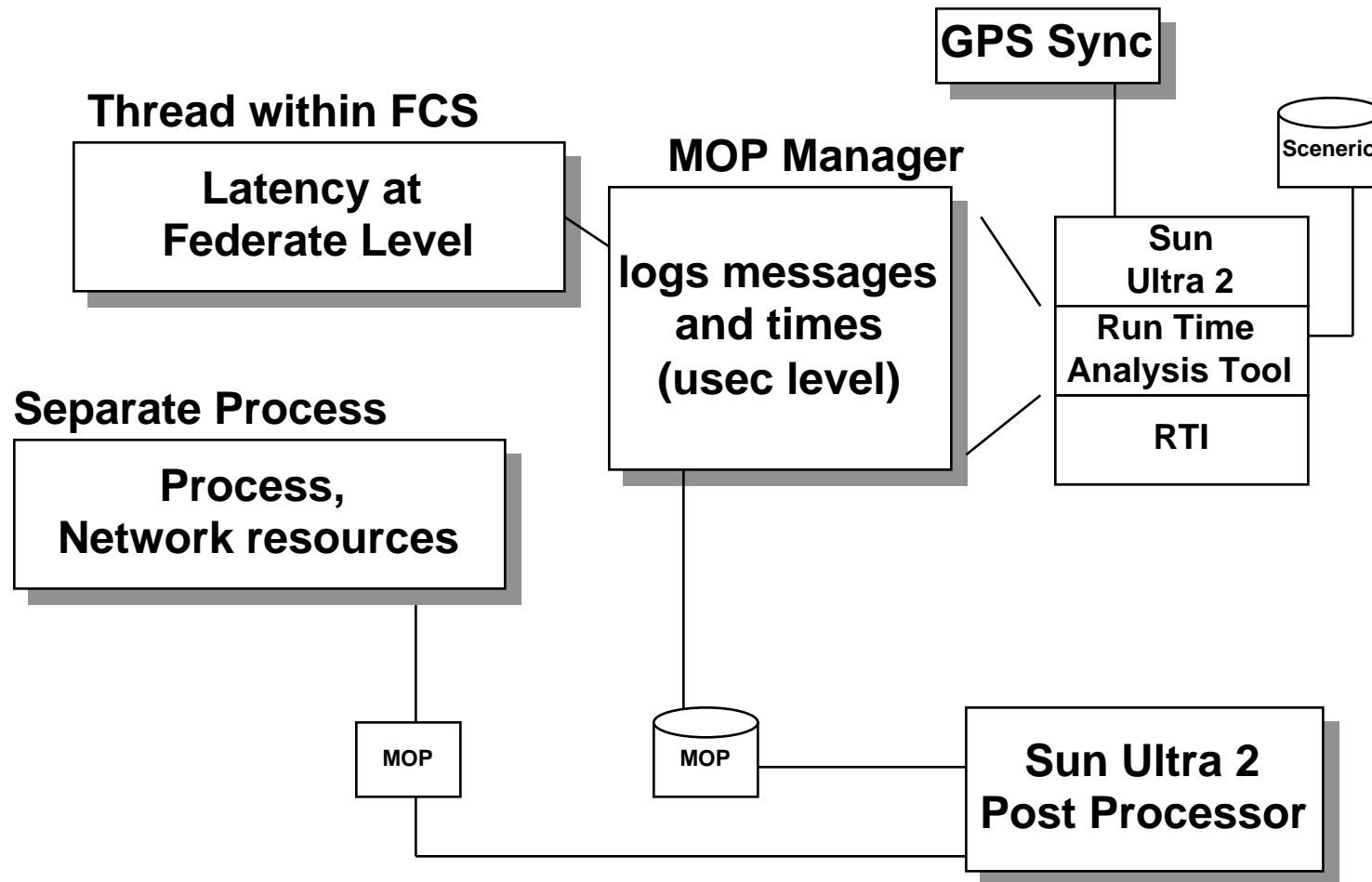
# entities/host



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next scenario will have 103 entities, third will be 244 entities

# Measurement Configuration



# Near Term DM Experiments Schedule

- **Integrate ATM fixes from MIT/LL**
- **Collect Data over Scenario's using RTI 0.33 and 0.33e**
  - 40 entity case (2,4,8 host) Finished July 19th
  - 103 entity case (2,4,8 host) Finished July 26th
  - 244 entity case (2,4,8 host) Finished Aug 2nd
- **Analysis of API support for Multiple Filtering Techniques**
  - Filter Space in baseline experiments - July 26th
  - STOW category scheme--Aug 2
  - JPSD active interest expression (source filtering)-- July 30 Initial, Aug 9 final
  - Source Based Multicast (clustering)-- July 30 Initial, Aug 9 final
  - Destination Based Multicast-- July 30 Initial, Aug 9 final
- **Provide input on IFSpec and API to DMSO and IFWG**
  - initial results on the interface spec/api --July 30
    - Is it workable, what parts may be implementation dependent, etc?
- **Declaration Management White Paper - Aug 31st**